

Aquarium fish culture in open village ponds in South 24 Parganas, West Bengal

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The successful breeding and propagation, rearing, and sale of various aquarium fish species is carried out on a commercial scale, primarily in Howrah and South 24 Parganas districts of West Bengal. These locations serve as major hubs for aquarium fish production in the region. In selected areas of these districts, over 600 families engage in traditional ornamental fishery¹.

Aquarium fish culture, also known as ornamental pisciculture, presents a promising opportunity for income generation, especially in suburban and rural areas, offering a potential solution to unemployment. Certain villages in Falta and Bishnupur-II Blocks (focused on freshwater) in South 24 Parganas are designated as 'Ornamental Fishery Villages'. In these villages, economically important aquarium fishes are raised by families on a cluster basis. This is either done in a series of rectangular cement concrete cisterns (with capacities ranging from 1,000 to 3,000 litres) constructed on vacant land within home premises under sheds, or in hapas

(rectangular net cages constructed from fine-meshed nylon nets and twine) for large-scale production. Hapas are secured to nylon ropes and bamboo poles and placed in shallow backyard ponds that are aged and naturally rich in planktonic population. It's worth noting that hapa-based aquarium fish culture is not observed in Howrah but is predominant in South 24 Parganas.

In the urban area of Howrah Municipality in the Howrah district, a few ornamental fish farmers, who also act as wholesale fish sellers to shopkeepers and hobbyists, rear aquarium fishes in tanks ranging from 120 to 240 square meters. These tanks have concrete sides and bottoms. Most farmers in this area typically use 6 to 36 medium- to large-sized cement concrete cisterns, each with a higher water-holding capacity.

A notable recent development in West Bengal involves two experienced aquarium fish farmers from the distant Canning-I and Patharpratima Blocks, situated near the Sundarbans

Bird fencing over Sri Sau's pond.



region in South 24 Parganas. These farmers, namely Sri Bikash Sau and Sri Swapan Parua, have introduced a new practice in the state. They engage in the scientific holding and rearing of aquarium fishes in open earthen and common village ponds. These ponds, being both perennial and rainfed, make use of natural food and the entire water body and large surface area for cultivation.

Sri Bikash Sau's aquarium fish culture unit

In the village of Tengrakhali-Kayalpara within the Dighirpar Gram Panchayat under Canning-I Block, Mr. Bikash Sau, aged 48, has achieved success in commercial-scale aquarium fish farming since 2018. His operation takes place in an open rainfed freshwater pond covering an area of 1,320 square meters, with a water depth ranging from 1.0 to 1.4 meters. This initiative, known as 'Coloured Fishes in Pond,' gained recognition from the Block Administration, TV News Channels, and fellow fish farmers in December 2021. The village is located 55 km away from Kolkata city, while Mr. Sau's residence is near Howrah Maidan, in the heart of Howrah city, District Howrah. He has leased the pond for this purpose.



A milky carp produced at Sri Sau's pond.



Sub-adult koi carp from Sri Sau's pond.

Mr. Sau has played a guiding role for two other aquarium fish growers in the Taldi GP area of the same block on this innovative practice. He secured financial support from a fishery-related scheme in the ATMA Project under the Department of Agriculture, Government of West Bengal.

Various aquarium fishes with good commercial value, such as milky carp, koi carp, red-capped goldfish, discus, and two varieties of angelfish, have exhibited satisfactory growth (reaching a marketable size of 5.0-7.5 cm) within fifty days from the stocking of seed. Typically, they are harvested within the next 30-45 days for sale. Additionally, red-eye tetras are also reared in the pond. Importantly, Mr. Sau adheres to an organic approach, refraining from the use of chemical compounds, commercial aqua-products, medicines, or antibiotics in his pond for rearing aquarium fishes.

Pond fencing and growth of fishes

To prevent the entry of the non-venomous but highly piscivorous water snake *Xenochrophis piscator* (measuring 0.45-0.75 meters), the pond is enclosed on all four sides up to a height of 0.45 meters from the level of the slope or embankment. This fencing is constructed using high-quality used monofilament net, specifically designed for catching climbing perch *Anabas testudineus* in natural water bodies and priced at INR 400 per kilogram with a 1 cm mesh.

The stocking of the pond involves introducing 75,000-90,000 high-quality aquarium fish seeds (3 days old) twice a year, initially in February-March. Throughout the cultivation period, a composted mixture of raw cow dung and molasses is added to the pond monthly. Additionally, a feed mixture for major carps and aquarium fishes, consisting of wheat flour by-product, soybean oil cake, groundnut oil cake (GNOC), and mustard oil cake, is provided in a controlled semi-decomposed state.

To protect the fishes from predatory herons, cranes, and kingfishers, a previously-used durable monofilament gill net in good condition is recycled.



Sample netting of growing aquarium fishes in Sri Sau's pond.

This net, originally intended for catching *Hilsa ilisha* in rivers and estuaries and priced at INR 140-150 per kilogram with a 3.8-5.0 cm mesh, is stretched overhead throughout the water area and slope of the pond.

The koi carp and milky carp, stocked at 12-20 mm (1-2 weeks old), reach a size of 8-10 cm within the next 75-120 days. Harvesting begins on the 90th day and continues until the 180th day. These fishes are transported for sale to wholesalers in oxygenated packets at a price ranging from INR 20-40 for fish measuring 10-15 cm. The demand for these fishes is significant at Kashipur (Sanpur) CTI, Dasnagar in Howrah, a well-known aquarium fish wholesale market.

Seed of goldfish, angelfish, and colour widow tetras are purchased at sizes of 5-7 mm (3-4 days old) for stocking. Angelfish are harvested and sold when they reach 3.8-5.0 cm in size, while colour widow tetras, stocked in limited quantity, are sold when they are 45 days old or older. Koi carp and milky carp of larger size fetch a price of INR 90-100 per piece.

In this pond, colour widow tetras achieve a size of 2.5-3.8 cm in 90-100 days, and angels, with a roundish body, reach a length (diameter) of 3.5-5.0 cm in 3-5 months. Lime is applied to the pond during the pre-stocking pond management phase. The farmer plans to lease two additional ponds nearby soon to transfer and restock the early stages of aquarium fishes from the current pond, ensuring low density for better growth.

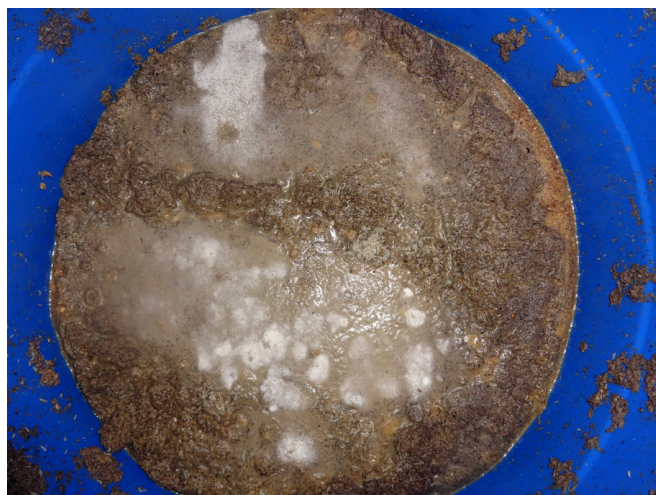
Major carps in aquarium fish pond

According to Mr. Sau, there is no harm or growth retardation observed in aquarium fishes when fingerlings of catla *Catla catla*, rohu *Labeo rohita*, and silver carp *Hypophthalmichthys molitrix* are stocked in smaller numbers alongside. For the past two years, starting in December, Mr. Sau has been introducing 40-45 rohu fingerlings (50-100 g), 30 catla fingerlings (200-250 g), and 20 silver carp fingerlings (7.5-10 cm) with koi and milky carp into the same pond with an area of 1,320 square meters. This practice aids in controlling excessive phytoplankton growth.

Within 4-5 and 6-7 months, catla grows to weights of up to 1.5 kg and 2 kg, respectively, in the aquarium fish pond. Marketable-sized major carps are harvested within the 4-5 month period (during April-May of the following year) and sold, providing an additional income source for Mr. Sau from the aquarium fish pond. Fingerlings of catla stocked at 10 cm attain a weight of 250 g in just 45 days in this pond.

Feeding practices

The aquarium fishes at Sri Sau's farm are fed a combination of commercially available fish feed from a reputable company (priced at INR 60-70 per kg) and a semi-decomposed, farm-made feed mixture. During the first 7-8 days of stocking, no feed is given to koi carp, milky carp, and goldfish, provided they are all 6-8 mm in size. From the 9th to the 30th day, only pulverised groundnut oil cake (GNOC) is given daily. From the 31st to the 50th day, a semi-decomposed mixture of GNOC and mustard oil cake is provided. Starting from the 51st day until the 75th day, a fermented feed mixture is given, consisting of 10 kg mustard oil cake, 10 kg machine-made dust from a rice mill, 5 kg wheat flour by-product, 5 kg GNOC,



Fermented-type fish feed prepared by Sri Sau.

2 kg soybean dust, and 25-30 g yeast. This mixture, partially decomposed with the addition of 40 litres of water, is applied to the 1,320 m² pond on the 7th-8th day.

From the 76th-80th day onwards, the application of the feed mixture continues for growing fishes, excluding GNOC. To enhance the zooplankton population in the pond, a composted mixture, including 70-80 kg cow dung, 3 kg single super phosphate, 5 kg mustard oil cake, 700 g urea, and 500 g limestone powder, is applied every 45 days. Occasionally, 'Success Booster' is included in this mixture. According to Mr. Sau, on the 90th day and beyond, 70-80% of aquarium fishes survive and reach a marketable size out of the initially stocked 75,000-90,000 seeds.

As of October 2023, Sri Sau is primarily cultivating koi carp and milky carp, with a limited presence of colour tetras and goldfish in the pond. Monthly drag netting is conducted, leading to the harvest of larger-sized fishes approximately 5-7 times per year. The frequency of harvesting is adjusted based on market demand and price patterns to optimise sales and meet consumer preferences.

Sri Parua's aquarium fish farm

At Biswanathpur village of Ramganga Gram Panchayat under Patharpratima Block, Sri Swapan Parua, aged 64, is engaged in commercial aquarium fish breeding and culture in open ponds with a slightly brackish nature. Starting in 2006 with goldfish culture, he has expanded to include varieties like ryukin, oranda, red-capped goldfish, black goldfish, and black oranda. Presently, he is also rearing imported-quality guppies, milky carp (in fewer numbers), and colour widow tetras. Having received training on aquarium fish culture from the Directorate of Fisheries, Government of West Bengal in both 2012 and 2023, Sri Parua sells aquarium fishes to businessmen at Kashipur (CTI), Dasnagar, Howrah on a weekly or fortnightly basis.

Rearing colour widow tetras, guppies, and goldfish

Sri Parua maintains four ponds, each 720 m² in area with 60-90 cm water depth, for his aquarium fishes. Bird fencing is carefully installed around and overhead of each pond. For goldfish, he procures good quality seeds that are 7-8 days old (priced at INR 0.20-0.30 per seed) three times a year



An aquarium fish pond of Swapan Parua.

(15,000-30,000 each time from CTI Dasnagar wholesale market, Howrah). For five varieties of colour widow tetras, he acquires rice grain-sized seeds at INR 1.00-1.25 per piece. Goldfish and colour tetras are reared separately as they have different feeding preferences. Goldfish accept floating pelleted feed (commercially available, 0.5-1.0 mm), while colour tetras are given sinking pellets.

In two ponds dedicated solely to colour widow tetras, Sri Parua stocks 120,000 seeds each time (4,500-5,000 / 64m² area), and in 45-60 days, they reach a marketable size of 3 cm, selling at INR 6-7 per piece. The colour widow tetras is fed with commercially available feed priced at INR 60 per kilogram. The feeding process takes place in suspended squarish tray-like structures, commonly used in commercial brackish water shrimp farming in ponds. These structures are positioned at a depth of 45 cm from the water surface. The colour widow tetras exhibits a tendency to consume a lesser amount of feed. During the initial 21 days after hatching, the fish only reach the size of a rice grain, indicating a slow growth rate.

In addition to his own farming practices, Sri Sau has extended his expertise to train one of his relatives in goldfish culture. This relative is now independently practicing goldfish culture in three larger ponds, each with an area of 1,320 m². During

each culture cycle, the farmer stocks 300,000 goldfish seeds in these ponds, showcasing a significant scale of goldfish cultivation.

For guppies, Sri Parua acquires brooder females at INR 10 per piece. Within a week, females produce young that are reared until adults and marketable stage (25-38 mm) in four months. They fetch a price of INR 2.50-4.00 per piece. Sri Parua maintains a stock of one-month-old 7,000-8,000 export-quality guppies, all at market size. According to him, sufficient phytoplankton growth in ponds is essential for proper body colour development in aquarium fishes. To achieve this, he employs a mixture of 10 kg of mustard oil cake, 6 kg of molasses, and 500 g of baker's yeast. This mixture is applied once or twice throughout the entire culture period. Additionally, liming is carried out at a rate of 1.5-2.0 kg per 64 m² of the sun-dried pond before stocking. After dewatering, ponds treated with commercial aqua-products and new stocking done on 10-12th day.

Similar to Sri Sau, Sri Parua employs a high-quality monofilament net with a 1.0 cm mesh on all four sides of his ponds, extending up to a height of 45 cm from the slope/embankment level. This netting serves as a protective measure against water snakes and frogs. Sri Parua sources water from a nearby large perennial pond, which can be pumped into the aquarium fish ponds as needed. These ponds have the flexibility of being totally drained and refilled as required.

On a weekly or bi-weekly basis, Sri Parua sells 3,500-4,000 marketable-sized colour widow tetras, goldfish varieties, and guppies to aquarium fish businessmen from his farm. Additionally, another batch of 7,000-8,000 aquarium fishes is harvested and sold during the same time frame from his relative's three ponds. In July 2023, Sri Parua further expanded his operations by constructing eight rectangular cement cisterns, specifically for rearing and maintaining guppies. This development was made possible through financial support from the Department of Fisheries, Government of West Bengal, as part of a developmental scheme. Over time, Sri Parua has honed the process of colour widow tetra rearing in open ponds, showcasing a continuous improvement in his aquaculture practices.

To maintain hygienic bottom soil conditions, Sri Sau and Sri Parua take measures such as liming, using a mixture of mustard oil cake, molasses, and bakery yeast, and applying composted mixtures containing cow dung, single super phosphate, mustard oil cake, urea, and limestone powder. Both farmers use monofilament nets with 1.0 cm mesh on all four sides of the ponds, extending up to a height of 45 cm from the level of the slope/embankment, to deter water snakes and frogs.



Author with Sri Swapan Parua.

Water from a nearby perennial pond is pumped into the aquarium fish ponds as needed, allowing for drainage and refilling. Harvesting is done every month, and bigger-sized fishes are collected 5-7 times a year based on market demand and price patterns. Sri Parua sells 3,500-4,000

Colour widow tetras collected after sample netting.



marketable-sized aquarium fishes every week or two, along with another lot of 7,000-8,000 fishes harvested from his relative's three ponds.

End Note

Sri Sau has observed that the growth of aquarium fishes in open pond conditions surpasses that in hapas and rectangular cement cisterns. The presence of natural light (sunlight), hygienic bottom soil conditions, and an abundance of planktonic food contribute to faster growth and bright body colouration of marketable-sized fishes in pond conditions. However, Sri Sau believes that aquarium fishes reared and produced in cement cisterns exhibit enhanced strength, hardiness, permanently bright body colouration, and greater longevity. As a result, they are preferred for purchase and placement in common rectangular glass tanks (50-120 litres) in homes and other locations compared to pond-grown fishes.

Sri Sau emphasises the importance of recognising the differences between the living conditions in an aquarium and an earthen village pond. Therefore, marketable-sized aquarium fishes harvested from open culture ponds should not be directly placed in common glass aquariums. Instead, to prevent fish mortality in the aquarium environment, harvested fishes should be maintained in rectangular cement cisterns for around two weeks with proper oxygenation and feeding before being sold to hobbyists and shopkeepers.

Both Sri Sau and Sri Parua maintain hygienic conditions of pond bottom soil with no foul smell, toxic gases, silt, black topsoil, or organic matter. Open culture ponds typically do not experience dissolved oxygen scarcity, so long as excessive phytoplankton blooms are avoided, eliminating the need for pond aerating devices, unlike in cement cisterns. Additionally, they highlight that unlike cultivable food fishes, particularly major carps, poachers would face challenges in selling aquarium fishes after catching them from ponds, either in live or dead states.

Production of juveniles and sub-adult spotted scat and pearl spot in open brackishwater ponds in South 24 Parganas as brackishwater ornamental fishes is reported². Although Canning-I and Patharpratima Blocks are not recognised as major centers for freshwater aquarium fish production in West Bengal, skilled farmers like Sri Bikash Sau and Sri Swapan Parua serve as inspirations for small and medium-scale farmers and aqua-entrepreneurs in nearby areas. Their success highlights the increasing potential and expansion of the aquarium fish business. The system of open pond production for aquarium fishes in villages is uncommon in the state, and these pioneers have introduced and demonstrated a new approach to this unique form of aquaculture.

References

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Feeding tray for colour widow tetras.



Colour tetras sampled from Sri Parua's pond.



Growing goldfish from Sri Parua's pond.